

HANDOUT 10-2

Human Factors Accident and Incident Analysis

Sensory and Perceptual Factors

- Misjudgment of distance, clearance, speed, and so forth
- False perception caused by visual illusion. Conditions that impair visual performance:
 - Featureless terrain (such as a desert, dry lake, water, snow).
 - Darkness and poor visibility.
 - Smoke and changing smoke patterns.
 - Mountainous terrain or sloping runway.
 - Anomalous light effects that cause flicker vertigo.
 - Low contrast of objects to background or poor illumination.
 - View into bright sunlight or moonlight.
 - Shadows.
 - Whiteout snow conditions.
- Spatial disorientation and vertigo. Conditions that affect sense of body position:
 - Loss of visual cues.
 - Adverse medical condition or physiological condition (alcohol and drug effects, hangover, dehydration, fatigue, and so forth).
 - Moving head up and down, looking in and out to change radios, answering or using cell phones.
- Loss of situational awareness. Types:
 - Geographic disorientation (such as deviation from route, loss of position awareness).
 - General loss of situational awareness (such as failure to perceive hazardous condition).
 - Erroneous situational assessment (misinterpretation of situation or condition).
 - Failure to predict or anticipate changing conditions.
 - False hypothesis confirmation bias (persistent false perception or misconception of situation).
- Attention failure (such as failure to monitor or respond when correct information is available). Types:
 - Failure to visually scan outside the vehicle or equipment for hazards.
 - Omission of checklist items.
 - Failure to respond to communication or warning.
 - Control-action error:
 - Failure to set, move, or reset control switch (lapse).
 - Unintentional activation of control switch (slip).
 - Control-substitution error (slip).
 - Control-reversal error (slip).
 - Control-adjustment or precision error (slip).
- Conditions that affect attention and situational awareness:
 - Inattention (focus on information unrelated to tasks).
 - Channelization, fixation (psychological narrowing of perception).
 - Distraction (preoccupation with internal [mental] event or with external event).
 - Task overload due to systems (such as communications).
 - Task overload due to equipment systems assignment factors.
 - Cognitive workload (problem-solving concentration or information overload).
 - Habit influence or interference.
 - Excessive crew stress or fatigue.
 - Excessive workload or tasking.
 - Inadequate briefing or preparation.
 - Inadequate training or experience for assignment.
 - Negative learning transfer (such as during transition to new assignment).
 - Adverse meteorological conditions
 - Tactical-situation overload or display-information overload.
 - Inadequate crew motivation or inadequate vigilance.
 - Inadequate equipment design.

Medical and Physiological Factors

- Carbon monoxide poisoning.
- Self-medication (without medical advice or against medical advice).
- Motion sickness.
- Incompatible physical capabilities.
- Overexertion while off duty.
- Influence of drugs or alcohol.
- Cold or flu (or other known illness).
- Excessive personal stress or fatigue.
- Inadequate nutrition (such as omitted meals).
- Hypoxia.
- Heat.
- Cold.
- Stress induced by heightened state of alertness.
- Affects of smoke.
- Dehydration.
- Other medical or physiological condition.
- Conditions that may cause adverse medical or physiological state:

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- Assignment tasking or job fatigue (such as being on duty more than 14 hours, late-night or early-morning operations).
- Cumulative fatigue (such as excessive physical or mental workload, circadian disruption, or sleep loss).
- Cumulative effects of personal or occupational stress (beyond stress-coping limit).
- Emergency condition or workload transition (from normal operation to emergency operation).
- Medical or physiological preconditions (health and fitness, hangover, dehydration, and so forth).

Knowledge and Skill Factors

- Inadequate knowledge of systems, procedures, and so forth (knowledge-based errors). Types:
 - Knowledge-based.
 - Inadequate knowledge of systems, procedures.
 - Used improper procedure.
 - Ill-structured decisions.
 - Failure in problem solving.
- Inadequate equipment control, or inadequate accuracy and precision of equipment maneuvering (skill-based error). Types:
 - Breakdown in visual scan.
 - Failure to see and avoid.
 - Over or under reacting.
 - Over or under controlling.
 - Inadequate experience for complexity of assignment.
- Misuse of procedures or incorrect performance tasks (rule-based error), such as:
 - Failure to perform required procedure.
 - Use of wrong procedure or rule(s).
 - Failure to conduct step(s) in prescribed sequence.
- Conditions that lead to inadequate operational performance:
 - Lack or variation of standards.
 - Loss of situational awareness in varying environment.
 - Demonstration of performance below required proficiency standards or current standards.
 - Demonstration of inadequate performance or documented deficiencies.
 - Inadequate essential training for specific task(s).
 - Inadequate recent experience or inadequate experience.
 - Lack of sensory input.
 - Limited reaction time.

Assignment Factors

- Failure of dispatch to provide correct critical information (such as frequencies, location, other equipment, or resources).
- Poor communication with other assets (such as ground or aircraft).
- Inadequate or faulty supervision from ground or tactical aircraft.
- Lack or variation of standards.
- Nonparticipant or noncommunicative equipment or resources at the scene.
- Loss of situational awareness in varying environment.
- Changing plans or tactics (change of teams on incidents).
- Unanticipated change of radio frequencies.
- Intentional deviation from procedures.
- Unintentional deviation from procedures.
- Demonstration of performance below required proficiency standards or current standards.
- Demonstration of inadequate performance or documented deficiencies.
- Inadequate essential training for specific task(s).
- Inadequate recent experience or inadequate experience for assignment.
- Transition (learning new equipment or operational systems).
- Inadequate knowledge of tactical situation.
- Lack of sensory input.
- Limited reaction time.
- Conditions that lead to inadequate assignment performance.
 - Smoke.
 - Wind shifts.
 - Changes in fire behavior.
 - Low visibility.
 - Unexpected equipment, resources, or aircraft.
 - Assignment intensity.
 - Assignment creep.
 - Assignment urgency.
 - Failure to recognize deteriorating conditions.
 - Time compression.
 - Diverts to new incidents.
 - Excessive communication demands.
 - Past assignment success based on high-risk behavior.

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Human Factors Accident and Incident Analysis

Personality and Safety Attitude

- Overconfidence.
- Excessive motivation to achieve assignment.
- Reckless operation.
- Anger or frustration on the job.
- Stress-coping failure (such as anger).
- Overly assertive or nonassertive.
- Inadequate confidence to perform tasks or activities.
- Acquiescence to social pressure (from organization or peers) to operate in hazardous situation or condition.
- Failure to report or act upon incidents of misconduct.
- Toleration of unsafe acts and behaviors.
- Poor equipment or assignment preparation.

Judgment and Risk Decision

- Acceptance of a high-risk situation or assignment.
- Misjudgment of assignment risks (complacency).
- Failure to monitor assignment progress or conditions (complacency).
- Use of incorrect task priorities.
- Intentional deviation from safe procedure (imprudence).
- Intentional violation of standard operating procedure or regulation. Types:
 - Violation of orders, regulations, standard operating procedures (SOP).
 - Crew rest requirements.
 - Inadequate training.
 - Violated agency policy or contract.
 - Failed to comply with agency manuals.
 - Supervisor knowingly accepted unqualified crew.
 - Failed to obtain valid weather brief.
 - Accepted unnecessary hazard.
 - Lacks adequate or up-to-date qualifications for assignment.
- Intentional disregard of warnings.
- Noncompliance with personal limits.
- Noncompliance with published equipment limits.
- Noncompliance with prescribed assignment parameters.
- Acquiescence to social pressure (from organization or peers).

- Conditions leading to poor safety attitude and risky judgment:
 - History of taking high risks (personality-driven).
 - Pattern of overconfidence.
 - Personal denial of wrongdoing.
 - Documented history of marginal performance or failure.
 - Excessive motivation (did not know limits).
 - Reputation as a reckless individual.
 - Failure to cope with life stress (anger or frustration).
 - Overly assertive or nonassertive (interpersonal style).
 - Influenced by inadequate organizational climate or safety culture (such as lack of adequate supervision).

Communication and Crew Coordination

- Inadequate assignment plan or brief.
- Inadequate or wrong assignment information conveyed to crew (dispatch or supervisor errors).
- Failure to communicate plan or intentions.
- Failure to use standard or accepted terminology.
- Failure to work as a team.
- Inability or failure to contact and coordinate with ground or aviation personnel.
- Inadequate understanding of communication or failure to acknowledge communication.
- Interpersonal conflict or crew argument during assignment.
- Conditions leading to inadequate communication or coordination:
 - Inadequate training in communication or crew coordination.
 - Inadequate standard operating procedures for use of crew resources.
 - Inadequate support from organization for crew-coordination doctrine.
 - Failure of organizational safety culture to support crew resource management.

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Human Factors Accident and Incident Analysis

System Design and Operation Factors

- Use of wrong switch, lever, or control.
- Misinterpretation of instrument indication.
- Inability to reach or see control.
- Inability to see or interpret instrument or indicator.
- Failure to respond to warning.
- Selection or use of incorrect system-operating mode (mode confusion).
- Overreliance on automated system (automation complacency).
- Conditions that contribute to design-induced crew errors:
 - Inadequate primary equipment control or display arrangement.
 - Inadequate primary display data or data format.
 - Inadequate hazard advisory or warning display.
 - Inadequate system instructions or documentation.
 - Inadequate system support or facilities.
 - Inappropriate type or level of automation, or excessive mode complexity.

Supervisory and Organizational Factors

- Not adhering to rules and regulations.
- Inappropriate scheduling or crew assignment.
- Failure to monitor crew rest or duty requirements.
- Failure to establish adequate standards.
- Failure to provide adequate briefing for assignment.
- Failure to provide proper training.
- Lack of professional guidance.
- Undermining or failure to support crews.
- Failure to monitor compliance with standards.
- Failure to monitor crew training or qualifications.
- Failure to identify or remove a known high-risk employee.

- Failure to correct inappropriate behavior.
- Failure to correct a safety hazard.
- Failure to establish or monitor quality standards.
- Failure of standards, either poorly written, highly interpretable, or conflicting.
- Risk outweighs benefit.
- Poor crew pairing.
- Excessive assignment tasking or workload.
- Inadequate assignment briefing or supervision.
- Intentional violation of a standard or regulation.
- Failure to perceive or to assess (correctly) assignment risks, with respect to:
 - Unseen or unrecognized hazards.
 - Environmental hazards or operating conditions.
 - Assignment tasking and crew skill level.
 - Equipment limitations.
- Conditions leading to supervisory failures:
 - Excessive operations or organizational workload (imposed by the organization or imposed by organizational chain).
 - Inadequate organizational safety culture.
 - Supervisor is over-tasked.
 - Supervisor is untrained.
 - Inattention to safety management (inadequate safety supervision).
 - Inadequate work standards or low performance expectations.
 - Inadequate or poor example set by supervisors.
 - Inadequate safety commitment or emphasis by supervisors.
 - Organization lacks an adequate system for monitoring and correcting hazardous conditions.
 - Supervisors fail to promote and reward safe behavior or quickly correct unsafe behavior.
 - Organization lacks adequate policies and procedures to ensure high quality work performance.

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Human Factors Accident and Incident Analysis

- Organization lacks adequate job-qualification standards or training program.
- Organization lacks adequate internal communication.
- Organization had no system or an inadequate system for management of high-risk employees.
- Organization lacks adequate process or procedures for operational risk management.
- Organization fails to provide adequate human factors training.
- Organization fails to ensure sufficient involvement of medical and occupational health specialists.
- Organization fails to establish or enforce acceptable medical or health standards.

Maintenance

- Procedures.
 - Unwritten.
 - Unclear, undefined, or vague.
 - Not followed.
- Records.
 - Discrepancies entered but not deferred or cleared.
 - Entries not recorded or not recorded in correct book(s).
 - Improper entries or unauthorized signature or number.
 - Falsification of entries.
- Publications, manuals, guides.
 - Not current.
 - Were unused for the procedure.
 - Incorrect manual or guide used for procedure.
 - Not available.
- Training.
 - Not trained on procedure.
 - Training not documented.
 - Falsified.
 - Not current.
- Personnel.
 - Not properly licensed.
 - Insufficient (staffing).
 - Improper or insufficient oversight.
 - Not properly rested.
- Management.
 - Nonexistent.
 - Ineffective.
 - Understaffed.
 - Ineffective organization of assigned personnel.
 - Insufficiently trained.
- Quality assurance.
 - Nonexistent.
 - Insufficiently trained.
 - Ineffective.
 - Not used when available.
- Inspection guides.
 - Unavailable.
 - Procedures not followed.
 - Insufficient.
 - Not current.
 - Not approved.
 - Not signed off.
 - Falsified.
 - Unapproved signature or number.
- Tools or equipment.
 - Improper use or procedure.
 - Uncalibrated.
 - Used improperly.
 - Not trained for the special equipment or tool.
 - Not used.
 - No tool control program.